High Specific Energy Lithium-ion Batteries with Novel Cathode, Phase I

Completed Technology Project (2013 - 2013)

Project Introduction

Energy Storage is a critical component of space-based platforms across the full spectrum of exploration, scientific experimentation, defense, communications and monitoring missions. NASA has set targets of 265 Wh/kg of 675 Wh/l for batteries for near-term energy storage applications. Li-ion battery technology has the highest energy density among rechargeable battery technologies. However, achieving the near-term goals require implementation of next-generation active materials. We propose to develop Li-ion cells that meet NASA's near term targets by combining our CAM-7 cathode material, the highest energy content market-ready cathode material available with market-ready Si-based anode materials. Because of its high reversible capacity (> 205 mAh/g), high discharge voltage (average 3.85 V vs. Li) and high density (4.8 g/cc), CAM-7 can yield higher energy Li-ion cells than any other market-ready cathode material. A version of CAM-7 targeting portable power and vehicle applications has been fully developed and, as part of its commercialization, is currently being transitioned to a 50 ton per year plant in Massachusetts. In the proposed Phase I program, TIAX will optimize the CAM-7 composition to yield the highest possible cell energy while still meeting the life targets, and simultaneously optimize an anode electrode incorporating a market-ready Si-based material. TIAX will then combine them in Li-ion cells that demonstrate the resulting system's ability to meet all NASA near-term energy, performance and life targets. The Phase I program will demonstrate, at the 200 mAh cell level, performance and cycling of electrode designs projected to meet and exceed NASA's near-term targets when they are incorporated in 18650 cells. A successful Phase I program will be followed by a Phase II program in which such 18650 cells are developed, assembled, and rigorously tested against NASA requirements.

Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

TIAX LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Continued on following page.

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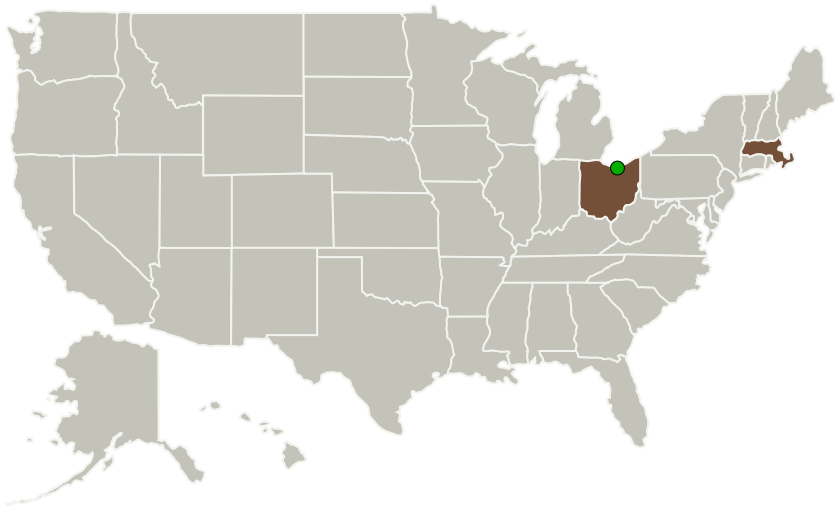
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
TIAX LLC	Lead Organization	Industry	Lexington, Massachusetts
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Massachusetts	Ohio

Project Transitions

May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138220)*

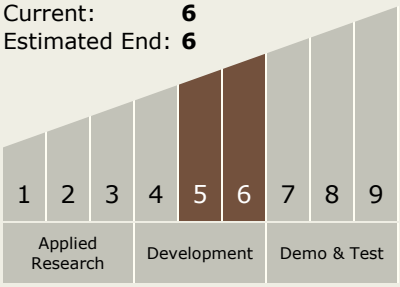
Project Management *(cont.)*

Principal Investigator:

David Ofer

Technology Maturity (TRL)

Start: **5**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.2 Energy Storage
    - TX03.2.1 Electrochemical: Batteries

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System

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Images

Project Image
High Specific Energy Lithium-ion Batteries with Novel Cathode
(https://techport.nasa.gov/image/131918)